REMARKS

The above-identified patent application has been reviewed in light of the Examiner's Action dated August 24, 2005. Claims 90, 101, 109 and 117 have been amended, and claim 120 has been canceled, without intending to abandon or dedicate to the public any patentable subject matter. Accordingly, Claims 90-119 and 121-126 are now pending. As set forth more fully below, reconsideration and withdrawal of the rejections of the claims are respectfully requested.

Initially, applicants would like to thank the Examiner for the courtesies extended during the telephone interview that was held on October 27, 2005. During that interview, the disclosures of the cited references and potential amendments to the claims were discussed. No agreement regarding allowable subject matter was reached during the interview.

Claims 90-100 and 109-126 stand rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent No. 5,757,523 to Wood et al. ("Wood") in view of U.S. Patent No. 5,255,065 to Schwemmer ("Schwemmer"), and Claims 102 and 106 stand rejected under §103 as being unpatentable over Schwemmer. In addition, Claims 101, 103-105, 107 and 108 stand rejected under 35 U.S.C. §102 as being anticipated by Schwemmer. However, because the cited references, whether considered alone or in combination, do not teach, suggest or disclose each and every element of the claims, reconsideration and withdrawal of the rejections of the claims are respectfully requested.

The present invention is generally directed to the transmission of communication signals using optical wavelengths through free space. More particularly, the embodiments of the present invention are directed to mitigating the adverse effects of turbulence on transmitted signals. In addition, embodiments of the claimed invention provide techniques for separating different wavelengths within a beam, such that multiple communication channels transmitted as part of a single beam can be reliably demultiplexed.

The Wood reference is generally directed to optical radiation devices. In particular, Wood discusses the use of a hologram consisting of a transparent plate on which an interference

pattern has been embossed. The interference pattern is designed to produce an array of beams from light provided by a source. The array of beams together form a composite beam having a predetermined shape and or distribution in the far field (Wood, Col. 3, line 57 to Col. 4, line 11.) More particularly, the shape of the beam in the far field is selected to conform to a remote target area. (Wood, Col. 2, lines 14-19.) In addition, Wood specifies the use of a hologram in order to make the light impossible to focus, and therefore effectively uses the hologram as a diffuser. (Wood, Col. 3, lines 2-5.) Furthermore, by diffusing transmitted signals to obtain a particular shape, individual target areas, for example encompassing an individual house or offices in a building, Wood provides communication coverage over the selected area. Accordingly, Wood does not teach, suggest or disclose transmitting a coherent beam containing a number of communication channels through the atmosphere, in which a diameter of the beam at an aperture of the transmitter is less than an inner scale of the atmosphere at the aperture of the transmitter. In addition, although Wood mentions that the provided grating could be used to separate into different detectors light at several different wavelengths, Wood does not teach, suggest or disclose the use of a number of detectors that are each associated with a focusing element that are provided with light from a holographic element. Furthermore, Wood does not teach, suggest or disclose selecting a divergence angle of a transmitted beam such that a divergence angle is greater than a worse case atmospheric turbulence induced deviation of the beam.

The Schwemmer reference is generally directed to a conically scanned holographic lidar telescope. More particularly, Schwemmer discusses transmitting an outgoing laser beam that is collimated by and diffracted off the center of a holographic optical element, to be transmitted coaxially along the receiver's field of view. (Schwemmer, Col. 3, line 38-40.) Laser light back-scattered by the Earth's atmosphere acts as a reconstruction beam that is conjugate to the original reference beam. (Schwemmer, Col. 2, lines 65-68.) A holographic optical element diffracts most of the desired laser radiation into a converging beam that is the conjugate of the original object beam, and is brought to a focus on a detector. (Schwemmer, Col. 2, line 68 to Col. 3, line 3.) Schwemmer also discusses a multiple wavelength system in which the different wavelengths are separated along a common optical axes. (Schwemmer, Col. 3, line 66 to Col. 4, line 3.)

However, Schwemmer does not teach, suggest or disclose transmitting a laser beam having a diameter that is selected to be less than the inner scale of the atmosphere at the transmitter aperture. In addition, Schwemmer does not teach, suggest or disclose selecting a divergence angle for a transmitted beam such that it exceeds the atmospheric turbulence induced beam deviation under a determined worse case condition. Furthermore, Schwemmer does not teach, suggest or disclose focusing elements associated with separate detectors forming a spot size that is smaller than a first focusing element. In addition, Schwemmer is not directed to transmitting information-bearing signals. Instead, Schwemmer is concerned with transmitting a non-information-bearing signal from a first location, and receiving a version of that signal that has been reflected off of a volume in the atmosphere in order to obtain information regarding that volume in the atmosphere.

Claim 90 is generally directed to a method for receiving high frequency signals. The method includes transmitting a coherent beam comprising at least one signal including first and second data modulated onto the beam from a laser transmitter through atmospheric turbulence to a receiver. According to Claim 90, the diameter of the beam is less than an inner scale of an atmosphere at an aperture of the transmitter. In addition, Claim 90 recites that the divergence angle of the transmitted beam is selected so that it exceeds a determined turbulence induced beam deviation so that a far field footprint of the beam remains on the receiver aperture despite the atmospheric turbulence. Claim 90 additionally recites receiving a distorted signal including the first and second data at a detector assembly associated with a receiver and detecting the first data using a first detector unit and the second data using a second detector unit. As discussed above, the cited references do not teach, suggest or disclose transmitting data through atomospheric turbulence using a laser beam having a diameter that is less than an inner scale of an atmosphere at the aperture of the transmitter. Furthermore, the cited references do not teach, suggest or disclose selecting a divergence angle of the transmitted beam such that it exceeds a determined turbulence-induced beam deviation. Accordingly, for at least these reasons, Claim 90 and dependent Claims 91-100 and 123-125 are not obvious, and the rejections of these claims should be reconsidered and withdrawn.

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Claim 101 is generally directed to an apparatus for receiving high frequency first data associated with a first wavelength and high frequency second data associated with a second wavelength. In particular, Claim 101 recites a holographic unit that receives said first and second data. In addition, Claim 101 recites a detector assembly responsive to a holographic unit for detecting the first and second data, the detector assembly including a first detector unit and a first focusing element having a refractive index that reduces a focal spot size associated with the first data, wherein the first focusing elements is in direct physical contact with the first detector unit. Claim 101 additionally recites a second detector unit and a second focusing element having a refractive index that reduces a focal spot size associated with the second data, wherein the second focusing element is in direct physical contact with the second detector unit. As discussed above, the cited references do not teach, suggest or disclose different detector units that each have an associated focusing element in direct physical contact with their respective detector unit. Furthermore, the cited references do not teach, suggest or disclose focusing elements in direct physical contact with associated detector units in which the focusing elements produce a reduced focal spot size. Accordingly, the rejections of Claim 101 and dependent Claims 102-108 and 126 should be reconsidered and withdrawn.

Claim 109 is generally directed to a system for receiving high frequency signals. Claim 109 recites a receiver that receives at least one signal including first and second data and that comprises a detector assembly. Claim 109 also recites a transmitter that transmits the at least one signal as a beam having a diameter that is less than an inner scale of an atmosphere at or near a transmitter aperture through atmospheric turbulence to the receiver, wherein the receiver is located at a distance of greater than 100 meters from the transmitter. In addition, Claim 109 recites that the atmospheric turbulence is determined to be associated with a worst case atmospheric turbulence induced deviation of the beam, wherein a divergence angle of the beam is selected to exceed the atmospheric turbulence induced beam distortion under the determined worse case condition. Claim 109 also recites that the first and second data are transmitted at a rate greater than one gigabyte per second. As discussed above neither the Wood nor the Schwemmer reference teaches, suggests or discloses the use of a transmitted beam having a

diameter that is less than an inner scale of an atmosphere. Furthermore, the cited references do not discuss selecting a divergence angle that is greater than a determined worse case atmospheric turbulence induced deviation of the beam. Also, the cited references do not discuss the use of such a beam in connection with transmitting first and second channels at high data rates as claimed. Accordingly, the rejections of Claim 109 and dependent Claims 110-116 as obvious should be reconsidered and withdrawn.

Claim 117 is generally directed to a method for receiving high frequency data associated with at least a first wavelength channel. According to Claim 117, the first waivelength channel is received at a first receiving location after having passed through atmospheric turbulence. The received first wavelength channel is focused with a first optical element to form a focused beam having a focused first spot size that is focused at a first location. Claim 117 additionally recites further finitely focusing the focused first beam with a second optical element at the first location to form a further focused first beam having a further focused first spot size that is smaller than the focused first spot size. As amended, Claim 117 also recites receiving at the first location a second wavelength channel after the second wave length channel has passed through atmospheric turbulence. The second wavelength channel is finitely focused using the first optical element to form a focused second beam having a focused second spot size, wherein the second focus beam is focused at a second location. Amended Claim 117 also recites further finitely focusing the focused the second beam with a third optical element. The cited references do not teach, suggest or disclose focusing different high frequency data channels as recited by Claim 117. Accordingly, the rejections of Claim 17 and dependent Claims 118-122 should be reconsidered and withdrawn.

As discussed herein neither the Wood nor the Schwemmer reference teaches, suggests or discloses each and every element of the claims, whether those references are considered alone or in combination. Accordingly, the rejections of the claims as anticipated by or obvious in view of the cited references should be reconsidered and withdrawn. Furthermore, Applicant notes that the pending claims all generally relate to the transmission and reception of high frequency data signals. Accordingly, it is submitted that resort to additional references related to measuring

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characteristics of the atmosphere, such as inner scale using narrow beams or wind speed, would not be appropriate for at least the reason that such references are not related to high speed laser communications over large distances, or the transmission of data using laser beams as recited by at least certain of the claims pending in the present application.

The application now appearing to be in form for allowance, early notification of same is respectfully requested. The Examiner is invited to contact the undersigned by telephone if doing so would expedite the resolution of this case.

Respectfully submitted,

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